UNITED STATES DISTRICT COURT

FOR THE CENTRAL DISTRICT OF CALIFORNIA

UNITED STATES OF AMERICA, Plaintiff, v. FRANCISCA RODRIGUEZ GAMBOA, Defendant.	No. CR 18-379-ODW FINDINGS ON LIMITED REMAND FROM THE NINTH CIRCUIT Hearing Date: February 24, 2020 Hearing Time: 1:30 pm Location: Courtroom of the Hon. Otis D. Wright

Having considered the parties' submissions and the testimony presented at the evidentiary hearing on February 24, 2020, the Court makes the following findings of fact. The Court would reach these conclusions under any standard of proof, regardless of which party bears the burden.

CHEMISTRY EXPERTS AND EVIDENCE

1. Dr. Brian Stoltz, Ph.D. (Professor of Chemistry at the California Institute of Technology), Dr. Travis Williams, Ph.D. (Professor of Chemistry at the University of Southern California), and Dr. Daniel Willenbring, Ph.D. (Drug Science Specialist, Drug Enforcement Administration) (collectively, the "chemistry experts") are qualified as experts in the field of chemistry. (See generally Exhibits 1-3 (declarations and curriculum vitae).)

2. The Court finds the chemistry experts' declarations and testimony credible. (See Exhibit 1 (GEX 2-8), Exhibit 2 (GEX 54-56), Exhibit 3 (GEX 84-85); 2/24/2020 Transcript ("Transcript") 9-117.) All the chemistry experts agreed with each other's sworn declarations. (See Transcript 12-13, 71-72, 94-95.) Moreover, the opinions reflected in those declarations and testimony are based on sufficient scientific facts and data, and they are the product of reliable principles and methods.

3. Defendant submitted no evidence contradicting the chemistry experts' declarations or testimony. Defendant had ample opportunity to find witnesses supporting her arguments. However, she presented no witnesses by declaration or at the February 24, 2020, hearing.

ISOMERS OF METHAMPHETAMINE

4. There are no "geometric," "geometrical," or "geometrical (diastereomeric)" isomers of methamphetamine. (See, e.g., Transcript 28-33, 80, 95-96; Exhibit 1 (GEX 5 ¶ 8, 8 ¶ 12(d)); Exhibit 2 (GEX 56 ¶ 8); Exhibit 3 (GEX 85 ¶ 7).) All of the chemistry experts agreed with this conclusion.

a. Because of the structure of the methamphetamine molecule, such isomers are impossible. (See Transcript 28; accord Exhibit 1 (GEX 5 ¶ 8, 8 ¶ 12); Exhibit 2 (GEX 56 ¶ 8); Exhibit 3 (GEX 85 ¶ 7).)

b. Indeed, as Dr. Stoltz testified, "to a chemist looking at" the methamphetamine molecule, "it's quite obvious . . . that there are no geometrical isomers of this compound." (Transcript 28.) Simply put, "geometric" or "geometric (diastereomeric)" isomers of methamphetamine "do not exist." (Transcript 33; Exhibit 1 (GEX 5 ¶ 8.)

c. Because this is the case, as Dr. Willenbring testified, amending the Federal Controlled Substances Act to cover "geometric isomers" of methamphetamine would make no difference, "[b]ecause there are no geometric isomers of methamphetamine." (Transcript 95.)

5. There are only two stereoisomers of methamphetamine: levo-methamphetamine (also referred to as "L" or "left-handed" methamphetamine) and dextro-methamphetamine (also referred to as "D" or "right-handed" methamphetamine). (Transcript 14-18; Exhibit 1 (GEX 5 ¶ 7); Exhibit 3 (GEX 85 ¶ 5).)

a. As Dr. Stoltz demonstrated using molecular models, these isomers are non-superimposable mirror images of each other. (Transcript 14-18; see Exhibit 1 (GEX 5 ¶ 7).) As a result, they are considered "entantiomers": that is, isomers that are non-superimposable mirror images of each other. (Transcript 21; Exhibit 1 (GEX 5 ¶ 7).) These are "optical isomers" covered by the federal Controlled Substances Act. (Transcript 96; Exhibit 3 (GEX 85 ¶ 5); Exhibit 14.)

b. There are no "diastereomers" of methamphetamine. (Transcript 33, 48-49, 86-87; Exhibit 1 (GEX 5 ¶ 8).)

6. Authoritative chemical dictionaries and textbooks support these conclusions. (See generally Exhibits 4, 5.) Specifically, the chemistry experts identified the International Union of Pure and Applied Sciences ("IUPAC") Gold Book as an authoritative "dictionary" for chemical terms, including the "nomenclature of organic molecules." (Transcript 13-14, 47, 72, 81; Exhibit 4 (Gold Book excerpts).)) As Dr. Williams testified, it is "the most authoritative definition of chemical nomenclature that is available

anywhere." (Transcript 72.) The IPUAC Gold Book identifies "geometric isomer" as an "obsolete synonym for cis-trans isomerism." (Transcript 23; Exhibit 4 (GEX 93, 98).) Methamphetamine has no such isomers. (Transcript 28-33, 72-73; Exhibit 1 (GEX 7 ¶ 12); Exhibit 2 (GEX 56-57 ¶¶ 6-8).) The same conclusion holds true for the consistent (albeit differently worded) definition of "geometric isomer" in Hawley's Condensed Chemical Dictionary (11th Ed., 1987). (See Exhibit 5 (GEX 115-16); see generally Transcript 78.)

CHEMICAL TERMINOLOGY

7. Consistent with the chemistry experts' testimony and with other authoritative sources considered by the Court, the Court makes the following findings regarding terminology:

a. The term "isomer" refers to molecules that contain the same atoms, but where those atoms are connected in a different spatial arrangement: like an identical set of Legos, assembled in a different way. (Exhibit 1 (GEX 2 ¶ 3); Exhibit 2 (GEX 54 ¶ 4); Exhibit 4 (GEX 99).) Different terms describe the relationship of atoms in a given type of isomer.

b. The term "optical isomer" derives from the change in the direction of plane-polarized light as it passes through molecules in a machine called a polarimeter. (Transcript 14; Exhibit 1 (GEX 6 ¶ 9).) The term "optical isomer" includes both "enantiomers" and "diastereomers" with observable optical properties. (Transcript 18-19; Exhibit 1 (GEX 3 ¶ 4, 6 ¶¶ 9-10); Exhibit 4 (GEX 102, IUPAC Gold Book); Exhibit 5 (GEX 118, Hawley's)).

c. "Enantiomer," as noted above, describes isomers that are non-superimposable mirror images of one another: that is, molecules with the same chemical formula, but with atoms arranged

differently in three-dimensional space such that the two isomers cannot be reoriented to fit directly over one another. (Transcript 21; Exhibit 1 (GEX 3-4 ¶¶ 4-5, GEX 7 ¶ 11); Exhibit 4 (GEX 96, IUPAC Gold Book).)

d. "Diastereomer" is a broad catch-all term, referring to any stereoisomer that is not an enantiomer. (Transcript 20-21, 64; Exhibit 1 (GEX 3 ¶ 4); Exhibit 4 (GEX 95, IUPAC Gold Book).

i. As referenced above, "diastereomers" with observable optical properties are also "optical isomers." Such isomers would include stereoisomers with observable optical properties that are not nonsuperimposable mirror images of one another. (Transcript 21; Exhibit 1 (GEX 3 ¶ 4, 6 ¶¶ 9-10); Exhibit 5 (GEX 111-12, Hawley's).)

ii. "Diastereomers" without observable optical properties, however, are not "optical isomers." Diastereomers that do not have optically observable properties can include "geometric isomers." (Transcript 22; Exhibit 1 (GEX 7 ¶ 11(a)).)

e. "Geometric isomer" refers to a type of isomer where atoms or groups of atoms are locked in a particular spacial position either on the same side or on the opposite side of a rigid structure--a double-bold, olefin, or saturated ring. (Testimony 22-28, 32-33; Exhibit 1 (GEX 7-8 ¶ 12); Exhibit 2 (GEX 55 ¶ 6); Exhibit 3 (GEX 85 ¶ 6); Exhibit 4 (GEX 93, 98, IUPAC Gold Book); Exhibit 5 (GEX 115-16, Hawley's).) Again, as noted above, methamphetamine lacks these structural features and thus cannot have geometric isomers.

DEFENDANT'S ARGUMENTS

8. For the following reasons, factual arguments relied on by defendant in her briefing are neither credible nor persuasive:

a. Government's Exhibit 11, which is a toxicology article that referenced a compound as a "geometric isomer of methamphetamine," is "erroneous and incorrect." (Transcript 41; see Exhibit 11.) That substance is not a "geometric isomer" of methamphetamine. (Transcript 41.) It is a constitutional isomer of methamphetamine. (Transcript 41.)

b. As he credibly explained in both his declaration and his testimony, Dr. Williams agrees that "geometric" or "geometrical" isomers of methamphetamine do not exist. (Exhibit 2 (GEX 56 ¶ 8); Transcript 73, 80.) They are "impossible." (Transcript 73.) He likewise testified, under oath, that he agreed with the declarations of Dr. Stoltz and Dr. Willenbring to that effect. (Transcript 71-72.)

i. Dr. Williams credibly clarified that when he referred to "geometrical isomers of methamphetamine" in an initial, unsworn e-mail to a prosecutor (Exhibit 12), he assumed that the prosecutor was in fact asking about "conformations" of methamphetamine. (Transcript 74-75, 85; accord Exhibit 2 (GEX 55 ¶ 7))

ii. As all expert chemists testified and as authoritative definitions reflect, "conformations" are not "geometric isomers." (See, e.g., Transcript 45, 75-78, 98; Exhibit 4 (GEX 94, IUPAC Gold Book); Exhibit 5 (GEX 110, Hawley's).)

iii. Instead, as both Dr. Williams and the other chemistry experts explained, "conformations" are different poses of a particular molecule in space. (Transcript 43-46, 75-76, 99.) They

are "all the same molecule," posed differently as the bonds in those molecules "move[.]" (Transcript 75-76.)

iv. "Conformations" are thus of a different character from the types of isomers discussed under both federal and California law (that is, "optical" or "geometric" isomers). (Transcript 78.) These categories of "configurational isomers" all involve "cleaving and reforming bonds"--that is, "disconnecting," and reattaching pieces of the molecule in different places. (Transcript 78; accord Transcript 42-45, 76.) They result in a different molecular substance. (Transcript 76.) "Conformations," by contrast, are simply different poses of the same molecule at a particular time. (Transcript 43-46.)

v. Federal law does not distinguish between conformations of a particular molecule, because they are simply "snapshot[s] of an individual molecule in time" (Transcript 45) as their bonds "vibrate and rotate" (Transcript 84). (Accord Transcript 99.) Although there are thus many conformations of methamphetamine in a given sample, none results in a geometric isomer. (Transcript 46, 79.) Indeed, the "configuration" of the molecule does not change. (Transcript 84.)

c. "Deuterium" also does not result in any isomers of methamphetamine that fall outside of the federal Controlled Substances Act.

i. "Deuterium" is a rare, naturally occurring form of hydrogen (an "isotope" of hydrogen) that has one extra neutron. (Transcript 33-37.) The relevant atom is still hydrogen. (Transcript 35.) However, because it has a slightly different atomic makeup, it gets a special name. (Transcript 35.)

ii. About 1 in every 5,000 hydrogen atoms, in nature, is a deuterium. (Transcript 37.) So, "in any batch of methamphetamine that's ever been produced, 1 in . . . every 5,000 times you have a hydrogen, one of them somewhere on th[e molecule's] structure is a deuterium." (Transcript 37.)

iii. Conventionally, chemists do not consider hydrogen isotopes when analyzing what isomers exist for a given molecule. (Transcript 61-62, 98.)

iv. Specifically, the Drug Enforcement Administration does not take deuterium into account when considering whether or not a chemical structure falls within the federal Controlled Substances Act. (Transcript 98.) Deuterated compounds are "regulated just the same as [their] parent compound[s]." (Transcript 98.)

v. However, even if one were to separately consider such isotopes (contrary to chemical convention), methamphetamine still has no "geometric" or "geometrical" isomers. (See Transcript 35, 37.) Geometric isomers remain impossible given the structure of the methamphetamine molecule. (Transcript 37.)

vi. Deuterated isotopomers of methamphetamine (that is, isomers created by the presence of deuterium) would all qualify as "optical isomers." (Transcript 39, 52-53, 92; see Exhibit 10.) Such isotopomers (also referred to as "deuterium-labeled methamphetamine") are covered under the federal Controlled Substance Act. (Transcript 98.)

ISOMERS UNDER CALIFORNIA LAW

9. Finally, the Court concludes that California's use of the term "geometrical (diastereomeric) isomers" likely relates to so-called "isomer defenses" related to cocaine. (See CR 96 at 10-12; Exhibit 7; Exhibit 8.)

10. Cocaine, unlike methamphetamine, has "geometric" or "geometrical" isomers. (Transcript 97.) Indeed, cocaine has isomers that are both "geometric" and "diastereomeric"---thus, "geometrical (diastereomeric) isomers." (Transcript 97.) Exhibit 15 depicts such an isomer: a "diastereomer of cocaine" that is also a "cis-trans" or "geometric" isomer. (Exhibit 15; see Transcript 97.)

11. As legislative history reflects, defenses related to these cocaine isomers appear to have been what motivated the California legislature to adopt its definition of "isomer" in California Health & Safety Code § 11033 (CR 96 at 10-12; Exhibit 8; see also Exhibit 7 (federal legislative history).)

12. Methamphetamine has no "geometrical (diastereomeric) isomers," as described by California Health & Safety Code § 11033. (Transcript 33, 97.)

IT IS SO ORDERED.

March 4, 2020
DATE

HONORABLE OTIS D. WRIGHT
UNITED STATES DISTRICT JUDGE